# PELAGOSPHÆRA, A LARVAL GEPHYREAN.

HAROLD HEATH.

In 1905 Dr. Pio Mingazzini published an account [1] of a gephyrean worm taken at a depth of 4,500 meters during an expedition of the Duke of Abruzzi in the neighborhood of Aukland. It is described as a spherical transparent organism, of about 6 mm. diameter, with a decided resemblance to certain sipunculid larvæ. However, as the author considered it to be an adult, it was placed in a new genus for which he states a new family may have to be created.

Spengel [2] chiefly on the basis of *Sipunculus* larvæ taken in the Bay of Naples, declares without hesitation that the animal in question is a larval form differing in a few minor details from other well-known types. The so-called gonad may well be the glandular appendages of the oesophagus noted in the young of several species.

During the past year two individuals, belonging to this proposed genus, have been taken in the surface plankton of Monterey Bay, Cal., and there is no doubt they are immature, the "gonadi" being, as Spengel surmised, glandular appendages of the pharynx. Nevertheless they present a number of features of considerable interest that are herewith described in some detail.

Both, apparently belonging to the same species, are spherical and measure 2.5 and 3.2 mm. respectively. In life the body wall was almost transparent, the muscles, especially those radiating from the mouth opening, appearing much as they do in *Doliolum* or *Salpa*. The alimentary canal was light yellow and the nerve cord and especially the brain were more opaque and fairly distinct.

The most prominent structure of these animals is the alimentary canal, which in its general features resembles that of the

[1] "Un Gefireo pelagico: *Pelagosphæra aloysii* n. gen. n. sp.," *Rendic. Accad. Lincei, cl. sc. fis., mat. nat.* (5), Vol. 14, pp. 713–720.

[2] "Eine verkannte Sipunculus-Larve," *Zool. Anz.*, Bd. 31, 1907

species studied by Mingazzini though there are some important organs that have remained undescribed. The mouth (*m*) opens into a gradually enlarging cavity, lined with a continuation of the cuticle surrounding the body as far as the opening of the ventral glands. At this point a large pouch-like diverticulum (*d*) is developed chiefly on the dorsal side of the gut, and the naked cells of its lining epithelium are relatively high and slender and bear an excessively heavy coat of cilia at least two or three times their own length. In his figures Mingazzini represents six large retractors and a few smaller strands attaching to this point

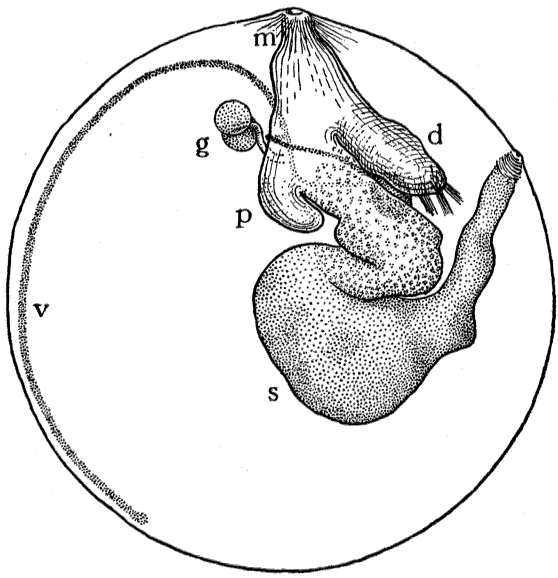


FIG. 1. Larval gephyrean (*Pelagosphaera*). The stippling of the gut is merely to differentiate the different divisions. *d*, dorsal ciliated diverticulum; *g*, glands and duct, slightly displaced; *m*, mouth; *p*, ventrical non-ciliated pouch or pharynx; *s*, stomach-intestine; *v*, ventral nerve cord leading to brain partially concealed by pouch *d*.

(though there is no sign of a pouch) and on the other hand radiating outward to become united to the body wall. In the present specimens the same is true. It appears probable therefore that this ciliated diverticulum may be everted and act as a locomotor organ as Wilson[1] has described in the case of *Echiurus*

[1] "Our North American Echiurids," BIOL. BULL., Vol. 1, 1900.

*pallasii*. And furthermore the proboscis or everted portion would, owing to its dorsal position, form a protuberance on the dorsal side of the mouth which would be situated, as in *Echiurus*, at its base. Perhaps to facilitate the eversion of this part of the digestive tract another outpouching (*p*) occurs on the ventral side of the gut, but its cells though columnar lack the ciliated coat, and it is without special retractor muscles.

This reference to *Echiurus* does not necessarily prejudice one in favor of the belief that the larvæ in question belong to this or allied genera. Setæ are totally lacking, there are no signs of segmentation, and so far as may be seen there are no cilia on the external surface of the body as in other gephyrean larvæ. For the present, at least, the question of systematic relationships cannot therefore be definitely determined.

Ventral to the gut in this same region are two spheroidal glands (*g*) in close contact with each other. In life they bear a fairly close resemblance to ova, which doubtless led Mingazzini to describe these organs as the gonad. Each is composed of a mass of pyriform cells, densely packed with a finely granular secretion from which ductules extend toward the inner face of each gland. A small duct, opening into the pharynx or œsophagus, extends anteriorly a short distance, and then bending ventrally it passes between the two glands whose ductules unite with it.

Beyond this point the digestive tract pursues an irregular course, and bending on itself passes dorsally to the anal opening. Three distinct divisions are clearly defined, the oesophagus, stomach-intestine and rectum. The first of these is of irregular outline, of relatively large caliber and its walls throughout are composed of columnar cells bearing a coat of delicate cilia. In the region of the stomach-intestine it narrows considerably and its walls become longitudinally folded. The stomach-intestine (*s*) is at first a comparatively large sac with highly glandular walls, each gland cell pyriform with the swollen distal end distended by some lightly staining, vacuolated secretion. Diatoms occur in this section of the tract together with small quantities of some other material, all of it enveloped in a stringy looking coagulum. Although the gut is narrowed for a considerable dis-

tance before the rectum is reached, and appears in whole mounts to be differentiated into a definite intestine, sections show that this same glandular epithelium extends from œsophagus to rectum. This latter structure is characterized by longitudinally folded walls lined with cuticle and provided near the anal opening with a strong sphincter muscle.

The nervous system is free from the ectoderm and is constructed upon the usual gephyrean plan. Posteriorly the nerve cord terminates in a slight enlargement, as noted by Mingazzini, and on the other hand, after following the body wall to a point close to the pharynx it bends inward and in the neighborhood of the duct of the ventral glands bifurcates to form the œsophageal collar. The course of these connectives in two or three sections is difficult to follow, owing to their small size and the abundance of connective tissue and muscle fibers, but the plan shown in the figure is probably not far astray. The bilobed brain is very distinct in both sections and in whole mounts, but it has been impossible to trace any nerves from it with the exception of the connectives.

The kidneys are two in number and consist of short coiled tubes opening to the exterior. I have examined these organs with much care but have failed to find that they have any internal opening. In every case the two extremities are in close contact, but the glandular portion includes the distal extremity, apparently, and if any inner pore does exist it is minute and not a well-developed nephrostome. The gland cells are fairly well defined, more or less vacuolated and contain considerable quantities of a finely granular secretion. In the neighborhood of the pore the glandular elements disappear, the canal becomes of much smaller caliber and after a short, sharp twist opens to the exterior.

The fatty substance described by Mingazzini is lacking in the present specimens, though in all probability this may be a variable feature. Also no trace of sex cells has been found, and there is therefore no reason to consider this an adult form so that a generic name is uncalled for as Spengel maintains.